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Date: March 5, 2007

Name: Nancy Doble

Signature:

*Nancy Doble*

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In re Application of John W. Evans, et al.	)	Examiner:	G. Del Cotto
	)		
Serial No.: 09/935,897	)	Confirmation No.:	2267
	)		
Filing Date: August 23, 2001	)	Group Art Unit:	1751
	)		
For: Reduced Toxicity Ethylene Glycol Based	)	Docket No.:	97541.00012
Heat Transfer Fluid and Use Thereof	)		

Dated at Hartford, Connecticut this 5th day of March, 2007

Mail Stop: Amendment  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

**DECLARATION OF JOHN EVANS**

I, John Evans, do hereby declare and say as follows:

1. I am an inventor of the above-referenced patent application regarding methods for cooling internal combustion engines or other heat generating devices using an ethylene glycol based aqueous heat transfer fluid. I am also the Chairman of the assignee of the patent application, Evans Cooling Systems, Inc.
2. Polyhydric alcohols such as ethylene glycol, propylene glycol and glycerol have boiling points that are much higher than the boiling point of water. At atmospheric pressure, the boiling points of these polyhydric alcohols are 198°C, 187°C, and 290°C respectively.
3. Combining a polyhydric alcohol with water produces a solution having a boiling point very different from the boiling point of the polyhydric alcohol but only slightly different from the boiling point of water. For example, mixing ethylene glycol and water 50%/50% by

weight makes a solution that boils at 107°C at atmospheric pressure, a boiling point that is 90°C less than the boiling point of ethylene glycol but just 7°C greater than the boiling point of water.

4. A primary virtue of a cooling system using a non-aqueous polyhydric-based heat transfer fluid is that the boiling point of the heat transfer fluid is much higher than water. It is relatively easy to condense the vapor from a polyhydric alcohol as compared to water vapor because the vapor from a polyhydric alcohol condenses at a much higher temperature.

5. In an aqueous cooling system, water is an important constituent of the heat transfer fluid and therefore any water vapor must be condensed to liquid water and retained in the system. Aqueous cooling systems are pressurized to increase the temperature at which water vapor can condense.

6. By contrast, in a non-aqueous cooling system using polyhydric alcohols, any water present is an impurity and not a functional element of the cooling system. A non-aqueous cooling system is operated at a typical temperature range from about 82.2°C (180.0°F) to 171.1°C (340.0°F) which is colder than the boiling point of the polyhydric alcohol, but well above the boiling point of water. If there is contamination of the polyhydric alcohol by a small amount of water, any vapor will also contain a water vapor fraction. The polyhydric alcohol fraction of any vapor condenses immediately in the heat transfer fluid, while the water vapor fraction cannot condense in the liquid heat transfer fluid because the liquid heat transfer fluid is normally hotter than the boiling point of water. Water vapor that may exist is treated as an impurity and vented from the cooling system.

7. In an aqueous cooling system, water dominates the boiling point of the heat transfer fluid. In a non-aqueous cooling system water does not dominate the boiling point of the heat transfer fluid. There are other important differences between how aqueous and non-aqueous

heat transfer fluids work but the boiling point issue alone is sufficient to differentiate aqueous and non-aqueous heat transfer fluids.


8. As recited in claims 33-40, the heat transfer fluids used in the methods of the present invention contain between 40% and 70% water. The fluids of the instant claims are thereby aqueous and are distinctly different from the non-aqueous fluids of copending applications Serial Nos. 09/910,497 and 09/935,982. Because of the very different ways that aqueous and non-aqueous heat transfer fluids function, I believe that it would not be obvious to one skilled in the art to modify a non-aqueous heat transfer fluid intended for use with no added water by adding 40% to 70% water. Similarly, it would not be obvious to one skilled in the art to modify a heat transfer fluid containing 40% to 70% water used in a water based cooling system by removing all of the water.

9. In the Office Action dated October 4, 2006, the Examiner has cited patents regarding deicing fluids used, for example, on airplanes. At low temperatures it is not possible to pump deicing fluids through heat exchangers that have small passageways, such as radiators, because deicing fluids are too viscous. At minus 20°C, for example, typical deicing fluids have viscosities of 18,000 cps or greater. The viscosity of 60% EG/40% water is 30 cps at minus 20°C; the viscosity of 30% PG/70% water is extrapolated to 30 cps at minus 20°C; and the viscosity of 20% glycerol/80% water is extrapolated to 8 cps at minus 20°C. There is no combination of polyhydric alcohols and water according to the instant claims that yields a viscosity as great as 100 cps at minus 20°C.

I, the undersigned, declare further that all statements made herein are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements are punishable by fine or

imprisonment or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Date: March 5, 2007

  
John Evans